

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION
DIVISION OF FORESTRY

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the State Forester's 1964 REPORT

EDMUND G. BROWN
Governor

HUGO FISHER
Administrator
The California Resources Agency

DE WITT NELSON
Director
Department of Conservation

ANNUAL REPORT
of the
CALIFORNIA DIVISION OF FORESTRY
for 1964

F. H. RAYMOND
State Forester

The State Board of Forestry

Whitford B. Carter, Chairman
Lancaster

Paul Aurignac
San Ardo

Leslie O. Cody
Red Bluff

Philip Abrams
Palm Springs

E. P. Ivory
Dinuba

Kelly B. McGuire
Ft. Bragg

Frank C. Myers
Fallbrook

COVER PHOTO

Looking northeast from the 17th floor of the State Resources Building, Sacramento, February 1965. From this vantage point at least a half dozen Division lookout stations may be spotted with powerful glasses, and Mt. Shasta can be seen on very clear days.

The three headquarters of the California State Forester since 1905 lie below - at the extreme right in the State Capitol (1905-1918); at the extreme left at 711 Forum Building (1918-1927; this is the white rectangular building which here hides the lower left portion of the tall brick J Building); and State Office Building No. 1 (once called Capitol Extension) in the picture center (1927-1964).

The lower right quarter of the photo shows the State Library and Courts Building. Employment Building is at lower left with the Sutter Club north up 10th Street. North of the Capitol the tall buildings right to left are Telephone (rear), Senator Hotel, and the 11th and L Building. At center is the Cathedral of the Blessed Sacrament, the spire of which is no longer the tallest structure in this city. Left center is the brick Elks Building with radio mast atop and breaking the skyline. Left of this in distance appears McClellan Field.

Photo Credit

page 3 - Santa Rosa Press Democrat
page 8 - Humboldt Times & Standard
page 12 - Oxnard CDF
page 14 - U.P.I.
page 15 - Calif. Hiway Patrol
page 19 - Fortuna Beacon News

THE STATE BOARD OF FORESTRY

The California State Board of Forestry held nine regular meetings during the calendar year 1964. As is the practice, the meeting places were well distributed throughout the State. San Bernardino, Ukiah, Porterville, Camino, Los Angeles, San Clemente and Sacramento were host cities to the Board in regular session. A great deal of the business before the Board involved its responsibility in hearing petitions from lumber operators in respect to the Forest Practice Act. There were several reports on pending legislation and programs, both Federal and State, such as the proposed National Redwood Park. Controls and plans for structural development within wildland, the management of State Forests, the relation of deer hunting season to the anticipated hazardous fire season, and similar problems were brought before the Board. The question of recognizing Santa Catalina Island as an area upon which the State of California should assume a partial responsibility for the cost of watershed fire protection was also considered and approved. The severe fire losses under adverse weather conditions and the effect of flood damage upon the lumbering industry caused the Board to request special and detailed reports of the current situation and to consider its position in recommending remedial action.

Board members Paul Aurignac and F.C. Meyers were formally reappointed to four year membership by the Governor. Philip Abrams of Palm Springs, a consultant in city planning and waterworks engineering, was appointed to succeed Board member Peter J. Cormack whose term had expired.

NEW HEADQUARTERS

On the weekend of November 21, professional movers transferred the headquarters property of the Department of Conservation from State Office Building No. 1 to the new Resources Building, a distance of two blocks. Office Building No. 1 had housed the State Forester and staff for 37 years. Now the rarified atmosphere of the 15th and 16th floors of the new (not entirely completed) office beehive was not universally appreciated by the employees. However, two or three months of time, a familiarity with the passageways, a little more confidence in the elevators -- and the family was at home in its new quarters.



OUR FORESTER IN CHILE

Don Puma dice: "El bosques son el futuro de Chile." (Mr. Mountain Lion says - The forests are the future of Chile.) This slogan on a fire prevention sign (spoken by Don Puma, the Smoky Bear of Chile) is a good one according to Paul Cox, Forester on the State Forester's staff in Sacramento.

Cox was assigned to work in Chile for two months as part of the Chile-California Program, a State program financed by the federal Agency for International Development (AID). Chile and California have many similarities and common problems. Climate, topography, weather, irrigated agriculture, mineral wealth, and historic ties are some of the similarities. Forest fires, water distribution, earthquakes, soil erosion, and transportation are some of the common problems. As part of our national aid program, Californians are being assigned to jobs in Chile to help our South American neighbors improve their economy and living conditions.

Cox worked on economic development of the Rio Maule Basin, an area in Central Chile with many land management problems, but also with a fine forest potential. He also reconnoitered a forested inaccessible area in southern Chile for a possible penetration access road for timber development.

Chile has extensive natural hardwood forests. She also has nearly one million acres of planted Monterey pine (Pinus radiata), a California native. Growth of the Monterey pine is very rapid. The best sites in Chile grow timber as fast as anywhere in the world. Forest industry technology ranges from very low (pit saws, logging oxen) to very high (modern paper mills).

There is room for much development of Chile's present and potential forest economy. Projects such as the Rio Maule development should help the Chileans achieve this potential.

OUR FORESTER IN SOUTHEAST ASIA

In mid-July, Assistant Deputy State Forester Levi T. Burcham was again asked by the Department of Defense to undertake special work in Thailand and that part of the world. Dr. Burcham had returned from a similar assignment on January first. For the present special tour of duty he has obtained a two year leave of absence from the Division of Forestry.



FIRE AND FLOOD



TO THE extent that the potentiality for a "bad" forest fire season may be predicted by moisture content of wildland soils and vegetation -- the outlook was serious in the spring of 1964. The fall and winter months had been unusually dry and cold throughout the State of California. New minimum precipitation records were established in some places where reliable statistics have been kept for nearly a century.

On the North Coast where some rains produced substantial moisture there was often a following dry north wind. In the central Sierra heavy snow fell early, but in the lowlands during February and March there was hardly a trace of moisture. Southern California also experienced an unusually dry winter and spring.

No fire season is finished in California in any region until heavy precipitation has drenched the area. Sometimes this occurs in October and sometimes not until after the calendar year has ended. Under any circumstances, the forest firefighter should be wary of heavy winds during September after the cumulative drought and warmth of summer.

In spite of the hazardous flammability of wildland vegetation the year 1964 could have passed into history as rather commonplace in the records of working foresters had it not been for the results of four violent spasms of Nature. These unusual events included wind and wildfire during two spring days in Los Angeles County, the seismic wave that crushed Crescent City, the September holocaust of northern California and Santa Barbara, and the late December floods.

THE LATE SANTANA

The California Division of Forestry played an active part in the battle of man against the destructive forces of fire and flood. Briefly, and in technically accurate if not scientific terms, this is what occurred in chronological order of events throughout the season.

Over the high mountain barriers and through the passes that surround the Coastal Basin and the lowlands of southern California come the infamous santana winds in the late fall and winter months. The dry winds, gestated over the Great Basin and deserts to the northeast, sometimes reach ground velocities of 100 miles per hour. The path of the blast is twisted and unpredictable across the complex broken land mass in the canyons and foothills, over the orange groves and the heavily populated areas of southern California. Fire unloosed at such times is terrible to contemplate and terrible in the havoc it has wrought throughout the years.

It can be factually stated that nowhere else in the world is the potentiality of fire damage so great and nowhere else has there been developed and assembled fire protection forces of men and equipment so competent to deal with this particular scourge. In fact, the accomplishment of the fire agencies in subduing wildfires in the highly flammable vegetation and heavily populated areas is truly remarkable. No more than one percent of the fires attacked extend beyond the stages of initial action and control.

The State Division of Forestry has been making it a practice for some years to transport a contingent of crews and firetrucks into southern California each fall season from northern stations after the first substantial rainfall in the north. This force augments the highly efficient Division organization in the south, and is available for assistance to other fire agencies if necessary.

Rarely do the wild gusts of the santana wind blast through the desert passes after approximately the middle of January. But this was decidedly not true in the calendar year 1964. The fire season of 1963 had been unusually gentle in southern California. In September, October and November good rains had started the growth of annual plants. It rained again in January, but there was none in February and little in March. From the first of the year repeated santana winds did considerable physical damage and dried out the land and the vegetation. But the fire services and good fortune prevented any unusual fire losses during this period.

Fire hazard was high when the severe winds of March 16 struck. Sixty mile winds did an estimated property damage of some two million dollars in the Glendale-Burbank area that morning. Fire Load Index readings of the Chatsworth-Newhall region (based on wind movement, humidity, fuel moisture and fire history) were at the extreme upper limit of the extreme fire danger range. On this day, the three fires called Chevy Chase, Whiting Woods and Weldon ran wild in Los Angeles County.

For about forty hours, turbulent winds and dry fuel had created a fire situation which was master over the excellently trained and dedicated firemen. At the end of these three separate and simultaneous fire battles, there were 11,650 acres burned, 20 houses destroyed and 10 severely damaged, with an inestimable potential soil erosion damage yet to be reckoned with.*

To assist Los Angeles County and the local fire agencies the Division of Forestry sent 12 Conservation Camp crews (standard crews are 16 men), forty pieces of automotive equipment including 14 pumper trucks, and 236 regular employees as overhead and liaison.

TSUNAMI

The locale of our story now moves to the northwest corner of California. On Good Friday, March 27, a violent earthquake had struck Anchorage, Alaska. At approximately 1:40 o'clock on Saturday morning a dreaded Tsunami or seismic wave 14 feet high crashed into Crescent City business district. Some 15 million dollars in damage resulted. Twelve persons died and 35 were injured. Twenty-seven city blocks were destroyed. Rescue and relief work began at once in the stricken city which is the county seat of Del Norte County.

In accordance with general statewide plans established to meet war and civil disasters, the Division of Forestry entered into the relief work. Before 3 a.m., by order of Ranger Joseph Springer, forestry radio stations in Humboldt and Del Norte were manned to furnish an emergency air communication network. Assistant State Forest Ranger John Rhea, on the scene, arranged with Sheriff Hovgaard to place five firetrucks and two pickups in the devastated area to standby for possible outbreak of fire and to look for casualties and to prevent looting. By dawn two additional firetrucks, two transport vehicles, a mobile kitchen and eight more Division men were dispatched into the stricken city.

Ranger Springer arrived by 2 o'clock Saturday afternoon and immediately conferred with civil defense officials. Additional fire trucks, two bulldozers and four inmate crews from Alder Conservation Camp with Camp Superintendent Jack Cloward were sent to the area. Eighteen regular Division men were assigned as overhead. Great piles of logs, building wreckage and other debris were cleared from the highways and burned. On the evening of April 2nd most of the Division personnel were relieved of special civil emergency duty. However, the inmate crews continued the cleanup work through April 6th.

* For further information on weather and fire behavior see C. M. Countryman, "The Los Angeles Fires of March 16, 1964". PSW Forest and Range Experiment Station Research Note 46.

HOT EARLY SUMMER

Hot dry weather settled upon California during the last ten days of June and during several short intervals of July. This resulted in a considerable outbreak of fires with consequent fire damage. About thirty fires reached proportions which required a report to Sacramento Dispatcher. These particular fires burned approximately 30,000 acres. In addition, two large fires in southern California burned upon both National Forest and outside private land. These were the 17,500 acre Cozy Dell fire of San Bernardino County and the Los Angeles County fire called Dry, which consumed some 12,000 acres.

IN LINE OF DUTY

- * On July 2, Equipment Operator James Carlisle died of severe burns suffered on June 22 while he was making a direct bulldozer attack on a chaparral fire in Tuolumne County.
- * Firefighter Richard Krejci died on July 14 of injuries sustained in a firetruck crash during a response to a fire in San Bernardino County.
- * John Quintin, a Trainee at the Oak Glen Youth Camp, was killed by a rolling boulder on a fireline in Riverside County on August 14.

THE ORDEAL OF MOSES

On August 5, 1964, dry lightning was striking along the ridges and peaks at the 7200 foot level of the central Sierra Nevada. One of the targets was a giant Sierra redwood named Moses by late coming white settlers. Moses the seedling had pushed through the soil some 25 centuries ago and now stands in venerable majesty near the boundary of the Sequoia National Forest. Undoubtedly this tree had been the target for lightning strikes many times in the past. This time, without the benefit of rain showers, fire was ignited in the gnarled top branches. Soon the fire was detected and reported to the fire suppression forces of the California Division of Forestry which protect the area.

Lightning fire in the tops of living trees or dead snags is nothing new to the forest firefighter. If the weather happens to be dry and windy this type of fire is a particular nuisance because it is difficult to detect and often it is difficult to control.

A 16 man crew, then a bulldozer and three pumper trucks arrived. They extinguished several spot fires around the base of the tree and continued clearing so that sparks and firebrands would not fall and ignite more fires. But the problem of how to get some 250 feet into the top of Moses and extinguish the small fire burning there was not so easily solved. For several days the fire officials stood on the ground and pondered the problem high above their heads.

Venerable Moses had nothing to say. But across the United States and throughout the world the small spot of fire made news headlines. Since the first grove of these giant trees was discovered by white pioneers they have been objects of general interest because they are the largest and among the oldest of living things. To the worldwide sentimental interest in the Moses tree generated by its impending doom there was here added the human element of man's struggle against one of the raw forces of nature. And further, the dramatic aspect of the situation was heightened in this case by the fact that man, puny as he appeared by the side of this old grandfather of trees, could boast of new and modern equipment available for his continual battle against wildfire in the forest.

So day by day, for seven days, the press services of the United States furnished to the news media of this country and London and Berlin and Paris a running account of the battle to save Moses. Early in the struggle a few air drops from helicopters were made and the fire at the top of Moses seemed to have been controlled. But a few days later a spike tip burned off and revealed a new flare up.

The Fire Boss on the ground considered bringing the great tree down with dynamite because of the difficulty of sawing through the 16 feet of its diameter. It would be interesting to know what consternation was caused throughout the world as this bit of news was broadcast.

On the morning of August 12, Ranger Raymond Banks took charge of the fire problem and ordered the dropping of 1000 gallons of surfactant-loaded water by helicopter. This attack appeared quite successful. However, much to the disappointment of the firefighters it was now discovered that a second fire had been smoldering some 50 feet below the top of old Moses. Now 500 gallons of gelled water was thrown against the side of the tree by some excellent precision flying of a helicopter by pilot Frank Raye of Fresno. The spot fire was drenched.

The ordeal of Moses was definitely over seven days after the lightning strike which caused this newsworthy event on a Sierra Nevada ridge where the ancient one grew, gnarled head high above a surrounding stand of valuable young saw timber.

MALICE IN HAYFORK

The most damaging timber-fire of the season resulted from a series of incendiary sets in the Hayfork Valley of Trinity County. On August 25th during a period of extremely low humidity some 17,000 acres were burned. This was a "joint fire" in which State and Federal forces worked together on the suppression job. About 13,000 acres burned were privately owned timber land.



THE WINDS OF SEPTEMBER

During the ten-day period September 19-27, a very critical situation existed throughout practically the entire State. Wildfires could become easily ignited, they were especially difficult to control, and the weather condition further contributed to the escape of fires across lines that would normally have held.

The entire State was under the influence of a large air mass which behaved much as the santana wind movements of late fall in southern California. This mass of air descended out of the north and east. It was dry and warm, and it became more so and moved faster as it lost altitude and pressed upon the earth and gusted through the mountain passes. On Friday, September 18, north winds began to blow violently. Fire potential over the entire State rose dangerously. On Monday the winds had reached peak velocity.

On Tuesday, the 22nd, velocities began to diminish but the air currents flowing down-slope and off-shore were hot and dry. In the redwood region, where the evenings are practically always cool, the temperature after sundown resembled that of the Sacramento Valley. One day the temperature at the Farallon Islands reached 80 degrees.

This weather pattern held until the evening of Friday, the 25th of September. Then pressure gradients relaxed enough to allow marine air to flow shoreward. On Saturday the familiar summer fog drifted over the tumbled hills of the northwest coast and its cooling influence spread

eastward. The period of extremely high fire hazard was ended. Men on patrol around more than 200 miles of fire perimeter could now view their task with weary relief and confidence in their victories.

Again, in October, a period of dry north wind raised some anxiety among forest firefighters. But no fires escaped to become holocausts. The fire season of 1964 came to an official end in early November.

During the 10-day period of high fire hazard in September, on forest-watershed lands protected by the California Division of Forestry there occurred 364 fires. The majority of these could have become great fires had they not been quickly attacked and extinguished. Several of the fires did become large, and these will be discussed in some detail below. A total of 103,435 acres was burned. Three of the fires destroyed 121 homes, 24 summer cabins and no less than 150 other structures. There was much other loss in mature timber, young timber, watershed cover, and miscellaneous industrial values. In addition there was the great holocaust around the city of Santa Barbara known as Coyote Fire.

This is briefly what happened, told somewhat in relationship of one incident and situation to another, especially as the whole episode affected the people of the California Division of Forestry.

Over 80 years ago an engineer and professional writer, originally from Scotland, came to the head of the Napa Valley with his new bride. He was seeking better health, and the warm springs of Calistoga were already becoming renowned as a health resort. Robert Louis Stevenson moved into a cabin and "squatted" where the State Park of his name is now located. This was at about the 2300 foot level on the south face of Mount Saint Helena above Calistoga. RLS wrote this description.

The tangled, woody, and almost trackless foot-hills that enclose the valley, shutting it off from Sonoma on the west, and from Yolo on the east - rough as they were in outline, dug out by winter streams, crowned by cliffy bluffs and nodding pine trees - were dwarfed into satellites by the bulk and bearing of Mount Saint Helena. She over-towered them by two-thirds of her own stature. She excelled them by boldness of her profile. Her great bald summit, clear of trees and pasture, a cairn of quartz and cinnabar, rejected kinship with the dark and shaggy wilderness of lesser hill-tops.

The dark eminence of Mount Saint Helena at elevation 4343 feet above sea level is still as impressive as it was to Stevenson in the days when the earliest white settlers were invading the tangled foothills he described. And when the winds are inclined to blow, their full force is recorded at the State fire lookout on the highest peak at the north end of Mount Saint Helena.

On Friday, September 18, the north-northwest winds were a fresh 14 to 18 miles per hour at the lookout station. At daylight on Saturday the wind had mounted to 63 miles per hour. Here, and over practically the entire State of California the fire hazard was extreme. And at daylight, at 6:45 a.m. to be precise, the trouble started.

Down in Nun's Canyon, across the vineyards of Sonoma Valley opposite the Jack London Ranch, a power line is presumed to have failed. Whatever the cause, a fire was ignited where dry and dense chaparral, Douglas-fir and oak woodland cover the western slopes.

At 10 o'clock, 16 miles to the north, up near the Stevenson monument on the Hanly property another fire started. A hunter is thought to have ignited the blaze by carelessness or deliberate intent. And, one hundred miles to the north, Division of Forestry personnel in Humboldt County were heavily involved with four timber fires.

At 1 p.m. that same day, some unknown incendiary started a fire a hundred miles east of Saint Helena, a couple of miles northeast of Auburn in Placer County on Forest Hill Road.

District I Headquarters at Santa Rosa appealed to Sacramento Dispatcher for additional strength. They asked for 15 leaders (called "overhead"), 10 fire trucks and 12 Conservation Camp crews. The additional forces were promptly dispatched from other Districts.

During Saturday daylight the forces of men and equipment attacking Hanly Fire held it to 300 acres in steep, rocky and timbered terrain. Nun's Canyon Fire was surrounded after about 1400 acres were burned. However, a portion of the fireline required some backfiring before the fire could be definitely controlled.

East, beyond the Coast Range and across the Sacramento Valley, the Auburn Fire appeared to be dormant. Firelines had been chopped and scraped to hold the fire between Forest Hill Road and Middle Fork of the American River, surrounding something less than a square mile of burned area.

The north wind registered 15 miles on Mount Saint Helena Sunday morning. During the night that wind had driven Hanly Fire southeasterly through heavy vegetation and over the rough ground of Palisade Ridge, adding another 300 acres of burned timber and woodland. Throughout Sunday on the Nun's Canyon Fire the burned area reached about 2000 acres. However, that situation seemed relatively secure with the north side backfired and the remainder of the perimeter undergoing mop-up and patrol. Auburn Fire was considered to be in a state of containment.

Up in Humboldt a recent permit fire escaped to burn 2850 acres.

Soon after midnight on Sunday an incendiary fire northwest of Lake Berryessa was discovered and held to 180 acres by diligent suppression effort. Sunday afternoon children with matches caused a fire near Rockport in Mendocino County in extremely difficult terrain and dense timber.

This fire held a terrible potential for damage and suppression costs - and at a time when there were plenty of other fire problems in northwest California.

Throughout Sunday daylight hours the hand-tool crews and leaders struggled to contain Hanly Fire. They were assisted by the dropping of retardant chemical from airtankers. At evening a perimeter line enclosed all but a dangerous small eastern segment near the Palisade bluffs. However, winds were beginning to pick up, and within the firelines burning tree trunks and other heavy fuels were much alive with flames and drifting sparks. The fire escaped. Flames began driving downhill toward Calistoga.

The latter part of the day, Fanny and I sat in the verandah of the Toll House, utterly stunned by the uproar of the wind among the trees on the other side of the valley. Sometimes, we would have it, it was like a sea, but it was not various enough for that; and again, we thought it like the roar of a cataract, but it was too changeful for the cataract; and then we would decide, speaking in sleepy voices, that it could be compared with nothing but itself. My mind was entirely preoccupied by the noise. I hearkened to it by the hour, gapingly hearkened, and let my cigarette go out. Sometimes the wind would make a sally nearer hand, and send a shrill whistling crash among the foliage on our side of the glen; and sometimes a back draught would strike into the elbow where we sat, and cast the gravel and torn leaves into our faces. But for the most part, this great, streaming gale passed unweariedly by us into Napa Valley, not two hundred yards away, visible by the tossing boughs, stunningly audible and yet not moving a hair upon our heads. So it blew all night long while I was writing up my journal, and after we were in bed, under a cloudless, starset heaven; and so it was blowing still next morning when we rose.

Silverado Squatters

At 10 p.m. Sunday the forward edge of the Hanly Fire had reached Palisade Mine two miles from the town of Calistoga. The gusty wind continued to increase. At midnight the fire had reached the junction of Silverado Trail and the Saint Helena Highway and houses were catching fire as swirling hot and dry air threw firebrands into the outskirts of Calistoga. This fire had run downhill a distance of three miles and descended some 2000 feet in elevation between sunset and midnight, burning timber and dense brush and woodland - a most abnormal fire behavior due to very abnormal weather.

At the lookout station, 4000 feet above the sweeping fire the dry north winds registered 75 miles per hour. Down in the protected Sonoma and Napa valleys the gusts reached 40 miles. By 3 o'clock in the morning on Monday some 47 dwellings and buildings were destroyed around Calistoga.

At 3:15 a.m. an incendiary fire was deliberately ignited on Mount George which lies east of Napa City. This required an immediate response of Division forces and diverted effort from the Hanly Fire. Five dwellings on the west slope of Mount George were quickly destroyed as the north wind drove the fire southward above Napa Valley with a burning front nearly a mile wide. At daylight Hanly Fire had grown to 6500 acres and was thrusting eastward and westward around and within the city of Calistoga.

On Sunday and early Monday the North Coast District Dispatcher had been appealing for aid. Locally the fire services of Napa, Sonoma and Solano counties had rallied in a mutually cooperative effort and were all heavily engaged. But this was a situation of extreme fire emergency. Thirty-one more out-of-District forest fire trucks were dispatched to the North Coast with 18 additional Conservation Camp crews. Seventy pumper trucks controlled by the California Disaster Office (and assigned to various fire departments) were ordered to enter the battle and concentrate upon structural defense around Calistoga, Napa and the Sonoma Valley towns in accordance with written mutual aid understandings.

Far away, in Placer County, the fire in the Middle Fork of American River was being held rather precariously. Then at 10 o'clock this Monday morning a gust of wind drove fire across the northwest corner. The front now raced westward. Then at 6 p.m. at the opposite side of the fire the north wind carried sparks across the American at three places. Now an entirely new problem existed upon the steep and heavily vegetated El Dorado County slopes of the American River. Ranger Mike Brock of Placer Unit could share his burden with Ranger Jack Burke on the El Dorado side. A fire camp was established near Cool. All during Monday night crews in the two Ranger Units fought a parallel battle to control the separate portions of one fire.

Strong north wind was sweeping down the Valley of the Moon at dawn on this Monday. Nun's Canyon fire was anything but secure. At 6:30 a.m. a finger of fire breached the southeast end of the line and the race began again. By noon the front had extended another mile south. The western, lower flank trailed southward along the edge of the vineyards of Sonoma Valley. The eastern flank was held at the ridges of the Sonoma-Napa boundary. Under the great rolling smoke billows that arose from the thousands of acres of burning vegetation, the light of day was weirdly red in the north coast country. But wherever the brisk north wind was



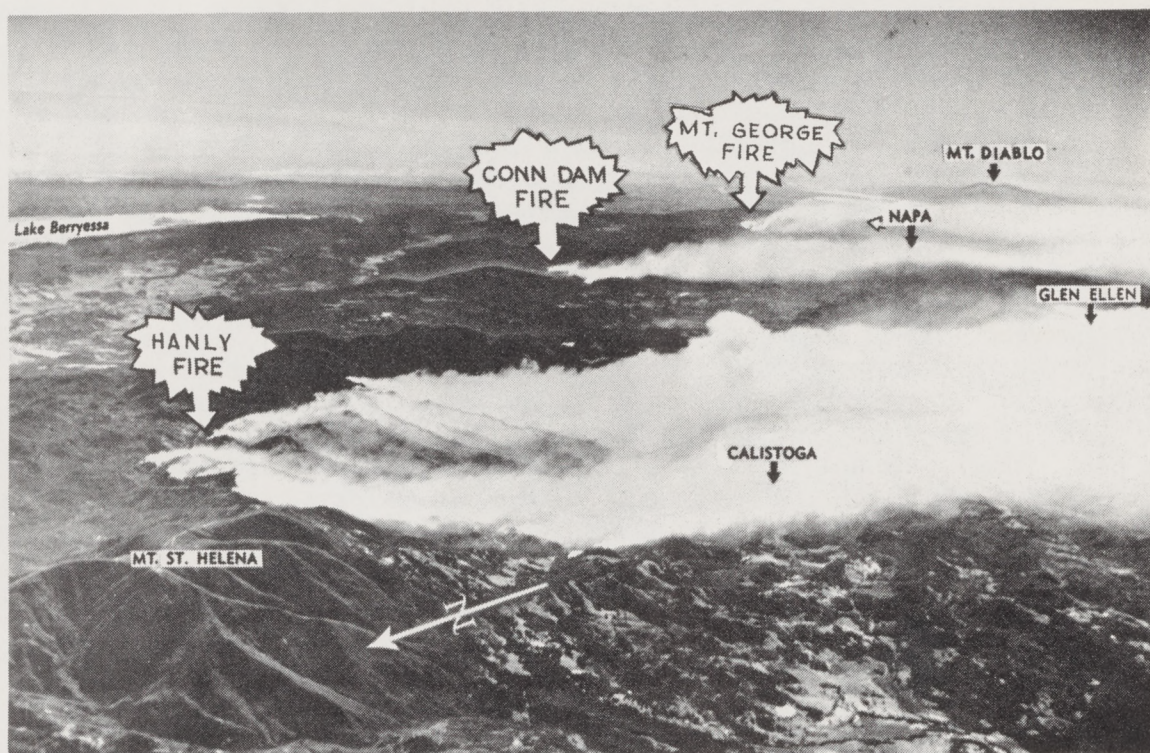
free from the smoke pall, clear blue skies presented a striking contrast over the beautiful countryside. On this Monday, September 21, throughout the North Coast District of the Division of Forestry, twenty-one new fire starts were reported to the Ranger Unit dispatchers. At mid-morning one fire near Lake Hennessy in Napa County, called Conn Dam Fire, blackened 600 acres before it was controlled at day's end. It is believed to have been started by a hunter. State men working on another incendiary fire in Clover Valley in Lake County were very grateful for the assistance of neighboring U. S. Forest Service crews from the Mendocino Forest. Most of the regular State force in Lake County was heavily engaged in the Hanly Fire battle.

Police and highway officers of the State and the several counties were busily involved in traffic control and offering whatever aid that might relieve the firefighters in their arduous labors. Firetrucks from small towns, fire districts, and cities as far away as San Francisco could be observed on the highways and back roads moving toward stations to which they had been dispatched. This was a day of crisis. North Coast District had appealed for more help on Monday morning. Seventy-four fire management and line specialists were dispatched from other Districts. Five crews of inmate workers from San Quentin and Folsom prisons also came. Twenty Civil Disaster Office fire pumper trucks were requested for protection of structures threatened by the Mount George fire.

In the meantime, the District Dispatcher of the State's Central Sierra District asked for and received the move-up of 16 Disaster Office pumper trucks from Mother Lode area cities and fire districts. This type of equipment is constructed especially for attack on fires in rural structures. It is more mobile and more self-sufficient than the complex big city-type fire pumper. The District Dispatcher urgently needed such reserve strength around Auburn in the event the southbound fire on the El Dorado County side should jump the American River and sweep up the steep and densely vegetated western wall of the canyon under the City of Auburn.

As the hour of Monday noon approached the brisk air over the Sacramento Valley was brilliantly clear. Farther west, out of the jumble of hills in the middle Coast Range long plumes of reddish gray smoke swept southward toward San Francisco Bay. The smoke trails were beat down against the earth by the gusting north and northeast winds.

Around the fire perimeters an organization of fire camps and command chains were established and then reestablished under extremely adverse conditions which were constantly expanding in scope and difficulty. This is a region of very broken topography and diverse natural vegetation, fortunately (for the firefighter), interspersed here and there with vineyards and small orchards. Young redwood and Douglas-fir trees stand in an unbroken crown with oaks, tanoak, madrone and the highly flammable California bay, called pepperwood in that region. The more dry or shallow soiled slopes support a dense tangle of chaparral of very hazardous ignition and heat potential. On this September day the several running fires in Sonoma, Lake and Napa counties each presented very difficult



Air photo taken about midday on Monday, September 21, looking southeast from north of Mount Saint Helena. (The Division of Forestry fire lookout station is the white spot under the "MT" on the picture.) The point of the north arrow lies in Yellowjacket Canyon. Hanly Fire had now been burning for approximately 40 hours. At this time it was taking off southwesterly on its wildest drive to the outskirts of Santa Rosa. At this time, too, wind eddies were beginning to carry the fire west and north into Yellowjacket Canyon. Knight's Valley is seen at lower right. That area shown on the photo was all eventually burned. The continuous intensity of the north wind is very obvious over the entire area. (Courtesy UPI)

and very dangerous problems of suppression for the thousand or so professional, semi-professional and volunteer firefighters engaged in the weary task.

At 12 o'clock noon on Monday, September 21st, the situation was bad. Hanly Fire swept across Highway 129, which is the main roadway up the Napa Valley. It leaped over the divide into Knights Valley of Sonoma County. The heights of Mount Saint Helena directly to the north offered no shield from the continuing wind blast. No doubt the sheer walls rising along Yellowjacket Canyon caused an even stronger air stream to veer westward over the burning lands. Swirling heat columns were now throwing firebrands a half to a full mile ahead of a ragged, fast-moving front. And yet, in spite of the wind, those hapless workers on the northwest rear flank of the fire, when they took time, could see above and behind them a red front of flames licking against the wind up the western escarpment of the mountain on both sides of Yellowjacket Canyon.

Hanly Fire's very indefinite main front was no longer running downhill. Now it was jumping across an intricate pattern of densely wooded



Main fire camp for the Hanly Fire. Fire Boss (Assistant Deputy State Forester Len Chatten) on the telephone. Equipment and material used in these camps is kept in unit complements ready for immediate transport to the fire manager's field headquarters. The problems of logistics and record keeping on a large fire are tremendous, quite aside from the problems of fire suppression strategy. Confusion is the fire's handmaiden. Orderly procedures and adequate communications are required in this battle against an enemy which never retreats.

and timbered ridges interspersed with pleasant small valleys and canyons. Many structures were consumed by flames as firebrands fell among the small farms and hideaway residences of this broken topography.

By late afternoon the major front had reached Porter Creek Road and by 7 o'clock was close to old Mark West Springs Resort.

By midnight the head of the fire had thrust southwest a mile from the outskirts of Santa Rosa City. Running wild and free before the wind this fire had covered, largely through the air, an airline distance of some ten miles since noon. As the vegetation on ridge tops ahead burst into new spot fires, turbulent wind eddies were driving the flames around and through the intricate gulches and canyons behind the front.

The men down there on the ground seemed very small and they knew that they were tired. But their resistance never ceased. Those in command were confronted not only with problems of logistics in moving and maintaining crews and equipment; a changing strategy of attack was also continually necessary.

Strategically, the situation on Hanly Fire had become much like the problem over on the Auburn Fire. Two long running flanks presented the practical fact of two segregated fire management problems.

Thirty additional fire trucks and their crews arrived in the vicinity of Santa Rosa during the Monday afternoon run. They came from the City of San Francisco, the counties of Marin, Contra Costa, Alameda, Sacramento, Yolo and Solano. By this time all the local fire services were heavily engaged.

While the main front of Hanly Fire was leaping southwestward on Monday the eastern flank above Napa Valley moved westward through very rough country one to two miles in distance into Swartz Canyon and Dutch Henry Canyon. The people of Aetna Springs and Saint Helena Sanitarium became deeply concerned because they were situated in the general windstream only a few miles distant from this secondary fire front. Pacific Union College at Angwin was also becoming apprehensive.

During Monday Nun's Canyon Fire had moved down the eastern slope of Sonoma Valley a half-mile past the Division's Glen Ellen Station. Regular highway traffic was routed through Bennett Valley because of dense smoke, the traffic of fire equipment, and the actual hazard to human life along the highway. The residents of Boyes Springs were becoming very uncomfortable as choking smoke from the approaching fire enveloped the community.

Some fifteen miles to the southeast, Mount George Fire had reached Lake Madigan west of the Twin Sisters Peaks. The fire had crossed the Solano County boundary.

Also on this day tens of thousands of citizens of inland San Francisco and the Daly City area were brought a little more close to the realities of wildfire than black headlines on the newstands would normally bring them. Children playing with matches on the lower slopes of grass and sage covered San Bruno Mountain had started a fire. It was an old story. By evening over 1550 acres of the steep western face was a black scar.

Came dawn of Tuesday, September 22. On the summit of Mount Saint Helena the north wind registered 60 miles per hour and stronger. Hanly Fire had covered some 35,000 acres of timber, woodland and brush. Nun's Canyon Fire exceeded 5000 acres, and south of Mount George there were 4000 blackened acres within the advancing fire perimeter.

New fires were starting to add new burdens to the overburdened North Coast District command. West of Healdsburg a structure fire spread into Mill Creek vegetation. Three days later this fire was controlled after a loss of 300 acres. In Mendocino County near Hopland a fire called Nacomis burned 90 acres. In the southwest part of Humboldt a new incendiary fire along the Mattole River consumed over 15,000 acres before it was stopped four days later.

The District asked for 50 additional overhead personnel. Six more Conservation Camp crews were dispatched as well as five crews of inmates from the Department of Corrections Training Center at Susanville. More Conservation Camp crews were sent the Central Sierra District to stand by for possible service in that area. But Auburn Fire was being "tied-in" around some 4600 acres burned in two counties.

Between 11 a.m. and 2 p.m. Nun's Canyon Fire reached Fetters and Boyes Springs in the lower Sonoma Valley. Twenty-six dwellings and other buildings were burned during these three hot hours.

And at 2 p.m., 300 miles to the south, another fire sprang up at the National Forest Boundary on Coyote Road near the City of Santa Barbara. Probably a spark from a vehicle exhaust was the cause. At any rate, the potential for disaster was well appreciated by the U. S. Forest Service and the local county, district, and city fire services. Heavy forces engaged in initial attack, including eight air tankers, 28 pumper trucks, eight tractors and 250 men. By 7 p.m. a line was dug in around the entire fire embracing some 200 acres. Two hours later the entire perimeter was lost in a swirl of heavy northeast wind. Coyote Fire was as free and wild as its namesake, and infinitely more dangerous. By morning twelve homes had been destroyed and six badly burned. There was much worse in store.

Strong winds still beat upon Saint Helena lookout tower on Wednesday, but in the lowlands the gusts had obviously abated somewhat. Airdrops of fire retardant chemicals were more successful now on the active spots of Hanly Fire perimeter. To a considerable extent the 35 miles of line around the oblong scar across country from Calistoga to Santa Rosa was dormant. The other oblong portion of the fire was still a great problem. This blackened area strung southeasterly across and over the high tumbled mountains from the summit of Saint Helena to Potato Hill, an air-line distance of ten miles.

Mount George Fire was pushing up the west face of Twin Sisters Peaks and flames were sometimes visible to travelers along the transcontinental highway in the vicinity of Cordelia.

A major new fire broke out northwest of Hopland in Mendocino County and burned 150 acres. The North Coast District requested more overhead and crews. Now 40 Conservation Camp crews from other Districts were at work in the District. Upon request, military and National Guard forces were placed on a readiness basis in the event the forecasted hazardous weather caused even greater fire burdens to descend upon the exhausted and over-extended forces.

Down in the Santa Ynez Mountains of Santa Barbara there was trouble. Chief Mohr requested help and the Division started 20 firetrucks with 10 more and a camp kitchen unit following the next day. That next day, Thursday, the 24th of September, saw 60 homes destroyed and many others damaged. There were 1400 firefighters on the lines with 54 bulldozers, 94 pumper trucks, 10 air tankers dropping fire suppressant material, and 4 helicopters. By the end of this day some 50,000 acres had been burned. It was also a tragic day for firefighters. There were numerous injuries in addition to the 34 men who were burned when they were overrun by the advancing fire. One of these men died. Logistics and supply were becoming a heavy burden upon the local fire managers. To assist in this respect the Division of Forestry established a fire camp in the Montecito area on the night of September 24. About 300 men daily worked out of this camp as their fire headquarters.

When the first sunlight on Thursday struck the long ridge of Mount Saint Helena the north wind registered 40 miles at the lookout station. However, the tired men around the length of fire line were beginning to gain confidence that they could win the weary battle. By 3 o'clock in the afternoon of this day the Sonoma section of the Hanly Fire was declared to be under control. The northern leg of the fire which twisted across the Napa mountains was not considered controlled until 6 p.m. the next day. Hanly Fire had covered 52,700 acres. During Thursday, Nun's Canyon Fire was completely surrounded and held after 10,430 acres had been burned. An hour earlier the Mount George Fire was declared under control. It had burned 8400 acres. By late afternoon the heavy north winds had diminished considerably and the next morning along practically all of the California coast a weak flow of marine air moved through the passes. The general change in the weather was fortunate indeed for the North Coast District because on Thursday and Friday three additional fires were well under way. One was in Miller Canyon, northeast of Mount Vaca, in Solano County. This burned 1800 acres. Another was near Annapolis in Sonoma County; and near Wilbur Springs in Lake County an incendiary fire burned 80 acres.

Forces from out-of-District began moving away from the North Coast on Friday, September 25th.

By Monday, the 28th, the outward progress of Coyote Fire had ceased. Many of the steep miles around the 67,000 blackened acres still required intensive patrol and "cold-trailing." Most of this fire burned upon the National Forest, and it was their estimate that damage, principally to the watershed, would be no less than \$19,000,000. The cost of extinguishing the fire was declared to be \$2,300,000. The Division of Forestry had placed 110 men and 64 pieces of motorized equipment at the disposal of the agencies responsible for direction of the fire control effort.

The first day of October was warm and pleasant throughout most all of California. A little rain fell on Del Norte County. At Redding the maximum temperature was 91 degrees, at Santa Barbara 70, San Francisco 74. On this day, upon the 28,726,000 acres of timber and watershed protected by the California Division of Forestry only ten starts of wild fires were reported. By the 28th of the month general rainfall brought a practical and officially declared end to the forest fire season of 1964.



THE CHRISTMAS FLOODS

The weather specialists were early and accurate in their predictions of disaster. At first they said it was to be a repeat of the 1955 great flood, and then they began calling it a "thousand year flood". That could have been quite literally true. In the north coast and the central Sierra drainages the concentrated rainfall and river crests were never known to have exceeded the record set between this December 19th and the end of the first week of January.

Property damage was estimated at some 138 million dollars when the waters receded. Twenty-four lives were lost. Perhaps 2000 persons were injured; more than 8000 families suffered some direct loss. Thousands of fine cattle drowned. Valuable bridges, highways and railroad lines were destroyed. Seven small communities were utterly eliminated and twenty others suffered severe damage. Crescent City was again smitten. This was indeed the grandfather of all known floods in California.

Many agencies of government and many civic and industrial groups labored unstintingly in the struggle. The story here can deal only with the part played by the California Division of Forestry - and that but briefly. There is reason for justifiable pride. Consider the words of Governor Edmund G. Brown in a report to the people on New Years Eve. In telling of the work of twelve State departments and agencies engaged in flood fighting and rescue, Governor Brown said, "I want especially to single out and commend the Department of Corrections and the Division of Forestry which has had 1200 Conservation Camp inmates and 165 supervisors working directly in the disaster areas, helping evacuate victims, setting

up relief camps, repairing levees and building emergency installations for protecting life and property."

Once again the Division of Forestry responded early to a general public emergency. On the afternoon of December 22 the first official request for assistance came from the Department of Water Resources Flood Operations Center. Four large bulldozers, 10 dump trucks and eight stakeside trucks with operating personnel were dispatched into designated areas to help keep rising rivers within man-made flood channels.

Other calls followed promptly for the same type of assistance. During the peak of activity a total of 1377 inmates grouped in 78 Conservation Camp crews from base camps throughout California were pressed into action along the Sacramento River levee system. Two Division of Forestry leaders worked with each 16-man crew, and in addition 45 overhead personnel were engaged in the complex problems of management and logistics. This was the time of year when Division of Forestry forces normally recuperate from the recent fire season labors and prepare for the next one. Vacations are taken and some of the vast amount of overtime which employees spend on summertime fires is recompensed during the winter months. In spite of this fact, Division employees made themselves promptly available for special flood duty. The central dispatching office at Sacramento was manned 24 hours a day throughout the entire emergency, as were those dispatch offices where flood work required continuous administrative attention. This was especially true of the District and Ranger Unit offices on the north coast and upper Sacramento Valley.

On the afternoon of December 22 a camp for inmate crews and regular Division forces was established at the Davis warehouse plant. The same afternoon a second flood fighting camp was established at the Colusa Fair Grounds for the Conservation Camp inmates who were working on the levees in the Colusa-Butte area. Other camps were established at the State Fair Grounds at Sacramento and at the National Guard Armory in Stockton. Later a fifth flood fighting camp was established by the Division at Hastings Island near Rio Vista. The crews there worked to protect the levees of the delta area of the lower Sacramento Valley. Wherever rising waters threatened to wash away levees, crew shifts working throughout the day and night were established. All of these men did excellent work and they well deserved the praise of Governor Brown.

After December 27 the high waters began to recede and many of the inmate crews were returned to their base camps. However, with the second phase of the storm in January it was necessary to reestablish 36 Conservation Camp crews with their leaders and kitchens and all of the equipment and tools needed for flood fighting work.

Over on the north coast the crews and supervisory personnel of Alder Conservation Camp and High Rock and Black Mountain camps were also heavily engaged in flood emergency work. However, in this area the work was more varied. There are very few stream bank protection systems on the north coast streams and this was pointed out as a factor in the high damage caused by flood water in that area. The reason for the installation of elaborate stream bank protection systems in the flat land of

interior California is, of course, to be found in the widespread effect of rising water as well as the great dimensions of the upstream watersheds feeding the Sacramento and San Joaquin rivers. The cities and the farms of the entire Central Valley have long suffered from floods.

At any rate, the men and the crews representing the Division of Forestry made themselves available upon the urgent requests of the constituted local authorities in civil defense and law enforcement, to the threatened towns people, and also to other State agencies such as the Highway Patrol and the Division of Highways. Forestry men also assisted the military in helicopter observation and evacuation of stranded families.

When it became evident that serious floods were going to occur throughout the north coastal area, Deputy State Forester Fairbank at Santa Rosa instructed forestry personnel (and requested Division of Communication radio technicians) to travel to the mountain top radio repeater station operated by the Division of Forestry and to remain there and keep the communication network fully operative. This meant sending men to Mount Saint Helena, Berryessa Lookout, Cahto Peak and Seigler Mountain. This was a wise move because the forestry network of communications served not only this agency but also the Division of Highways, the Highway Patrol and the California Disaster Office.

The number of individual cases of rescue and relief work performed by Division of Forestry personnel and Conservation Camp crews is long, and much of it was never recorded. In many communities there were cases of saving human lives. Drinking water was carried to isolated communities in fire trucks. Blankets were provided for those persons whose homes were under water or whose small communities were washed down the roaring rivers. Housing was provided in Division barracks and in some cases other agencies of government established headquarters in the ranger stations and fire crew stations. Community feeding was established where necessary. In one case an electric generator was loaned to a local police force; in other cases community communication systems were established by Division personnel, and these played an extremely important part in the communication network. At a couple of regular flood recording stations the equipment had been carried away and Division personnel continued making readings and transmitting information on mobile communication units.

Such towns as Alder Point, Garberville, Weott, Shivelly, Guerneville, Monte Rio, Dos Rios and others should long remember the men and women representing the California Division of Forestry during the great Christmas Floods of 1964-65. No doubt, many Division employees would have been individually cited for acts beyond the call of duty had they not simply considered such acts to be a normal response during a time of public emergency.

One surprised employee was Assistant State Forest Ranger Edward A. Poe of Mendocino Unit. He was called to an affair at Eureka Inn and awarded a special plaque by John Gronouski, Postmaster General, in person. The citation read:

THE POST OFFICE DEPARTMENT PRESENTS THIS CITATION TO EDWARD POE for unusual and outstanding assistance to the Post Office Department in helping to restore and maintain postal service under the most adverse conditions following the disastrous storms, floods, and destruction which struck Northern California in December, 1964. These acts of unusual courage and concern for fellow citizens deserve the highest praise and appreciation.

Signed this 30th. day of April,
1965 at Washington, D.C.

John A. Gronouski

Poe, sometimes assisted by Foreman Joe Haggard and Foreman Orozco maintained a sort of food and mail delivery service by foot over rough country for the adults and children of Dos Rios. Later the men helped reestablish commercial communication lines.

Perhaps the most succinct, honest and well deserved statement on behalf of the work of Poe and his numerous unnamed associates was presented by Governor Brown in a letter to Director DeWitt Nelson of this Department. Said the Governor in part:

... In addition to your people who fought the flood on the levees in the valley, those in the flood areas of the north coast did yeomen service on their own initiative in rescue, communications and other activities under hazardous and trying circumstances.

It is most noteworthy that the Division of Forestry's communications network was the only one in the north area that operated without failure throughout the storm and flood emergency. It provided invaluable service to local communities involved, to the military rescue craft, and to other units of State Government operating in the areas.

Thus we place on the record for posterity a brief narrative of some of the hours of honorable service performed by the employees of the California Division of Forestry during the travail of fire and flood; Anno Domini 1964.

CONSERVATION CAMP PROGRAM

The program of establishing new Conservation Camps continues. Site preparation was nearly completed for the new Cuyamaca Camp in San Diego County. The Sierra Conservation Center in Sonora neared completion. Out of that institution the Division of Forestry will work a 100-inmate camp, to be known as Baseline. Budgeted funds are available for three additional adult camps and two Youth Authority forestry camps.

The new Black Mountain Conservation Camp was activated on October 5, 1964. This 80-man inmate camp is near Cazadero in Sonoma County. Rainbow Camp buildings were replaced with the present up-to-date structures. Mount Bullion Youth Conservation Camp was increased by fifteen Youth wards in July of 1964.

As of December there were 31 adult camps with 2,360 inmates and three youth camps with 360 wards. These camps represented a total population of 2,720 inmates and wards in all forestry camps.

On fire control work during 1964 there was contributed by camp inmates and wards a total of 655,000 man-hours. However, this effort represented only 10.2 percent of the labor of these camps. Much repair and maintenance of Division roads, telephones and similar facilities was accomplished. There was general fire hazard reduction, forest insect abatement, nursery operation and maintenance, improvement of fish and game habitats. And during the "flood fight" over Christmas and New Years, some 70,000 man hours of inmate time was devoted to this emergency.

THE YOUTH CONSERVATION AND TRAINING PROGRAM

After a full year of operation the Oak Glen Youth Conservation and Training Camp was in a position to point to a substantial installation and to report successful progress in the program.

The camp was created by a special law of 1963, quite largely as an experiment in training and orienting young men so that they might achieve a sense of responsibility to themselves and society. The camp is in no sense a penal institution. Five Departments of State Government were given specific responsibilities under the law, while the State Forester was charged with management and operational responsibility of the camp.

The qualifications of the entering Trainees varied considerably, but all had a problem or they would not have found themselves in the camp. No safe generalities could be made as to any common characteristics for the first year's 363 enrollees. Most had a lack of self-confidence and showed it by withdrawal or a pugnacious attitude. However, within a few months the improved esprit de corps was remarkable.

Good food, exercise, instruction by competent practical and academic instructors, assigned responsibility within the group, team effort on the fireline, a personal sense of work achievement, school credits earned,

outside jobs acquired by some "graduates" -- were all factors which have led to what may be claimed as a successful program. Some of the entrants have slipped along the way. But the indication after only one year of experience gives hope that the majority of parents of these 16 to 21 year old Trainees would respond as did the mother quoted below in an unsolicited letter:

"To all the men who helped my son Joe in any way, I wish to thank you from the bottom of my heart. Thank you seems so insufficient; seems he went away a crazy mixed up kid and you turned out a man. He now sits and talks with me and is hoping for a job to finish his schooling."

AWARD

The American Association of Conservation Information, in making a judgment of Outstanding Television Programs, declared Second Place National Award for 1964 was earned by the 30 minute film "Critical Areas." The picture was produced by George Fox Corporation for the California Division of Forestry.

CONSTRUCTION COMPLETED

The following major Division of Forestry facilities were completed during 1964:

Prado Equipment Building and Warehouse (San Bernardino)
Oroville Headquarters Warehouse (Butte)
Susanville Forest Fire Station, 24-man barracks, 30-man messhall
(Lassen)
Crystal Creek Conservation Camp Residences (2) (Shasta)
Middletown Office Replacement (Lake)

Porterville Forest Fire Station (Tulare)
Hilton Forest Fire Station (Sonoma)
Irvine Lake Forest Fire Station (Orange)
Cambria Forest Fire Station (San Luis Obispo)
Cayucos Forest Fire Station (San Luis Obispo)

Black Mountain Conservation Camp, Sonoma County
Rainbow Conservation Camp, San Diego County

The five fire stations included combination messhall-barracks building, an equipment building with attached office and a gas and oil building together with site development as necessary.

GENERAL FIRE STATISTICS - Calendar Year 1964

Fire records compiled by the forestry agencies are segregated into so-called forest fire and non-forest fire groups. The former includes those wildfires which burn in vegetation upon an area zoned as forest land. This would embrace land which supports commercial timber species, young or mature, and also that land which has been classified as having general watershed value.

Non-forest fires are those which burn upon lands not classified as "forest", and fires which do not burn into forest vegetation. The latter would include fires confined to structures, vehicles, and similar man-made flammable values. Of course, much damage of a structural nature occurs as a result of properly classified forest fires. Corporate city lands are not included among "forest" areas for statistical purposes regardless of any natural vegetation that may be growing upon them.

The designation of a particular fire abatement agent to assume responsibility over specified land areas is a matter of land ownership and policy set forth in law. Statistics below give the general fire record of 1964 with emphasis placed on the protection agencies of the timber-watershed land owned by the State or private parties.

TIMBER AND WATERSHED FIRES ON STATE AND PRIVATE LANDS-(Zones I & II) (Does not include structural or vehicle fires)

<u>Protecting Agency</u>	<u>Acres Protected</u>	<u>No.Fires</u>	<u>Acres Burned</u>	
			<u>Timber</u>	<u>Watershed</u>
Cal.Div. of Forestry	28,726,022	3,665	39,605	165,330
U.S. Forest Service	5,232,230	596	1,114	26,858
Nal. Park Service	28,290	2	1	0
Hoopla Indian Reservation	2,326	10	1	0
Kern County	2,177,255	130	0	2,686
Los Angeles County	673,922	113	3,319	6,246
Marin County	250,452	104	349	350
Santa Barbara County	742,500	113	0	1,174
Ventura County	385,190	132	0	491
TOTAL	38,218,187	4,865	44,389	203,135

NATIONAL FOREST LAND (only) in California. Number of fires: 1658; acres burned, 105,041.

NATIONAL PARKS (federal land in California). Number of fires; 47; acres burned, 145.

DIVISION OF FORESTRY PROTECTION AREA ONLY. Number of NON-FOREST fires in timber-watershed, 2,454. Number of fires of all types attended by Division in RURAL area (Zone III) protected by Division

under contract: 7,431 fires which burned 13,047 acres of flammable vegetation in addition to structural values.

CREW ACTIONS - by California Division of Forestry Crews

Crew runs

9,169	to forest and watershed fires (Zone I & II only)
3,981	to structural and vehicle fires in forest-watershed area
9,778	to C.D.F. protected rural area (Zone III)
255	to U.S.F.S. border area fires
714	to city fires by rural C.D.F. Crews
2,013	to false alarm, rescue, and service calls
66	other
<u>25,976</u>	TOTAL runs and actions

TOTAL REPORTABLE FIRES attended during 1964 on land of all Zones protected directly by Division: 13,550

* * *

DIVISION OF FORESTRY BUDGET - FISCAL YEAR 1964-65

(1)	GENERAL SUPPORT (Excluding Emergency Fire)	\$25,350,809
(2)	FOR OTHER AGENCIES protecting State and Private State Responsibility Land	3,384,006
(3)	EMERGENCY FIRE FUND	1,700,000
(4)	BLISTER RUST CONTROL	75,000
(5)	INSECT CONTROL	20,000
(6)	FOREST AND FIRE RESEARCH	<u>312,585</u>
(7)	TOTAL ABOVE	\$30,842,400
(8)	CAPITAL OUTLAY	8,169,160

Explanation of above budget:

- (1) The Support Budget for the Division of Forestry was increased approximately \$1,994,511 over the 1963-64 fiscal year level. The increases are attributable to the following:
 - (a) Salary increase granted effective January 1, 1964 and July 1, 1964 that were not reflected in Governor's Budget, \$1,222,534.
 - (b) Conservation Camp activations, \$339,802.
 - (c) The addition of 8 Fire Prevention positions, \$122,630.
 - (d) An Assistant Deputy State Forester position was added to Division Headquarters to strengthen administration through program planning, \$15,000.

- (e) Two Assistant Civil Engineers and a Forester II were added to meet workload as a result of the expanded Conservation Camp Program and for Boggs Mountain State Forest, \$46,000.
- (f) The addition of four clerical positions, \$24,000.
- (g) The remaining difference can be attributed to merit salary adjustments and additional funds required to support the Youth Conservation and Training Program on a twelve-month base. Funds in 1963-64 fiscal year covered only an eight-month operation on the Program.
- (2) The allotment of funds to other agencies for protection of State and private land for which the Division is responsible has been increased \$560,000. The Contract Counties were increased \$546,000 as recognition for a level of fire protection equal to that being provided by the State. The allotment to U.S. Forest Service was increased \$14,000 as Operating Expenses were brought into line with existing State Standards.
- (3) Emergency Fire Fund is normally a basic appropriation of \$320,000. Need has exceeded \$2,000,000 in an extremely bad fire year. Augmentations from so-called Governor's Emergency Fund are requested when the need arises. (Anticipated 1964-65 expenditures, \$1,700,000).
- (4) Paid to U.S. Forest Service in matching expenditures for field projects.
- (5) To be expended in cooperative control projects in areas of serious infestation. It appears that it may be necessary to augment this item from the Governor's Emergency Fund during 1964-65 fiscal year to control the serious Tussock Moth infestation in Knox Mountain and Cedar Pass area in northern California.
- (6) Includes forest and fire research, \$173,002; soil-vegetation mapping, \$116,111; watershed research at San Dimas Experimental Forest, \$23,472.
- (7) The totals set forth represent the net expenditures of the Division (see also (8)). Gross expenditures approximately \$36,800,000, reimbursed by
- (a) Rural-Structural fire protection, \$4,500,000 (Contracts with counties and fire districts)
 - (b) From U.S.D.I. fire protection of 3.6 million acres of scattered public domain lands, \$478,000.
 - (c) Other reimbursements - collection for services to employees, rentals to other agencies, services to other agencies, etc., \$1,024,875.
- (8) Funds available for State building program; includes \$4,400,000 earmarked for Conservation Camp sites, construction and equipment. The State building program appropriations are available for three fiscal-year periods after appropriation.

EMERGENCY REVEGETATION

The airplane pictured here is fulfilling a contract to seed the Nun's Canyon Burn with 6 pounds of annual ryegrass seed per acre. Quick action is often required to revegetate watersheds denuded by fire when the situation poses an imminent threat of serious soil erosion and flood damage. In such situations, the State aids in the emergency revegetation of burned watersheds on behalf of the general public welfare.



Many of the large watershed fires which occurred in both the southern and northern parts of the State during 1964 necessitated quick appraisals of the need and extent of revegetation prior to expected winter rains. The Division of Forestry acted cooperatively with Counties and Federal agencies in nine revegetation projects involving seeding quick growing ryegrass on 62,724 acres of private and State land. Adjoining federal lands needing treatment were also seeded. Seeding done by contract for projects conducted by the Division cost from \$0.90 to \$1.35 per acre. This cost was shared by the agencies involved.

Since 1965 there have been 201,000 acres of critical watershed treated in this manner to secure the exposed soil against movement under winter rain. Evaluation of the results of these seedings, improvement of techniques, and testing of promising plants continue as important studies for Division watershed specialists.

SERVICE FORESTRY

Service Forestry is a nationwide cooperative program of technical forestry assistance to owners of small tracts of forest land and forest products producers.

Ten professional foresters are employed by the Division to help landowners solve problems of land and forest management. These service foresters are located in Fortuna, Willits, Santa Rosa, Redding, Oroville, Camino, Sacramento, Fresno, Monterey and Riverside. They are expert in tree planting, stand improvement, marketing of forest products, and other phases of land and timber management. Many owners of smaller tracts of timberland do not have the knowledge or ability to provide good forest management practices for their land. In total these owners own

nearly two million acres of forest land that is vital to economy of the State and especially important to the forested counties. The present and future productivity of this land and the growth of trees for the future are the specialties of the service forester. The forester's work with the owner increases the prospects for future well-being of the forest-based economy of the State.

In 1964 the service foresters received 2,532 requests for assistance. Over 1,900 owners of nearly 290,000 acres of timberland were given forest management assistance or advice. The foresters advised on the harvest of 7,231 acres of timber; helped with timber stand improvement on 4,775 acres; and assisted in the planting or seeding of 6,520 acres and assisted in the planting or seeding of 6,520 acres of land. Over a hundred forest products operators were assisted; more than \$1,500,000 came from the sale of forest products in which the service foresters helped in harvest methods, marked the trees to be cut, or helped in the marketing of timber or Christmas trees. This marketing and harvesting advice adds to the economy of the timber producing areas. Over 160 owners were advised to seek the help of consulting foresters or industrial foresters because of the size or complexity of the owners' problems or limitations on the service forester's time due to workload and the large number of requests the foresters must handle.

During the year increased emphasis was placed on the multiple use aspects of private forest land management on small ownerships. The service foresters in addition to timber production possibilities point out watershed, wildlife, range management and recreation potential to wildland owners. Some of the service foresters have spent considerable time on insect and disease control problems also.

Service Forestry is a cooperative program with the United States Department of Agriculture. The Forest Service, under the Cooperative Forest Management Act of 1950, reimburses about 30% of the cost of the program in California. Advice and assistance to owners participating in the Agricultural Conservation Program of cost-sharing for conservation practices is also partially reimbursed by the Federal Government.

TIMBER TAXATION

In 1964 Fresno County elected to exercise the provisions of Section 12-3/4, Article XIII of the State Constitution to declare young growth timber mature for assessment purposes. During the year 8,962 acres of young timber on 5 properties in two counties were returned to the tax rolls. Two members of the Board of Forestry (one for each county) and a member of the State Forester's staff were designated to act in this process along with a representative of the Board of Equalization and the local County Assessor. To date, 305,179 acres of such timber on 729 properties in seven counties have been removed from tax exempt status.

Two interesting developments in the tax field occurred during the year. The State Attorney General issued an opinion (No.64-74) to the effect that cut-over timber land, held by an owner as a tree farm, may be reclassified by the assessor as a potential homesite or subdivision development and taxed accordingly. The Senate Revenue and Taxation Committee conducted studies and hearings about laws and policies relating to taxation of extractive resources, including timber.

STATE FORESTS:

The 70,238 acres of California's eight State Forests are managed by the Division. These Forests are demonstration and experimental area for timber and Christmas tree production, watershed management, recreation and other multiple use aspects of wildland management. The four largest forests contain 69,000 acres and are staffed with professional foresters. This was accomplished early in 1965 when a full-time forest manager was appointed to the Boggs Mountain State Forest in Lake County.

The harvest of timber continues according to sustained yield cutting plans. In 1964, 25 million board feet of timber and 1,046 Christmas trees and many miscellaneous products altogether valued at \$423,532 were harvested. Total receipts to the State's general fund (1946-64) amount to nearly \$6,700,000. By law, in lieu property tax payments are made to the counties in which the Forests are located. These payments were \$40,430 in 1964 and have amounted to \$480,000 since the Forests were acquired.

On the Jackson State Forest in Mendocino County current interest is centered on the Caspar Creek drainage. A large cooperative watershed and timber production experiment is being conducted here. The watershed study received a severe test during the historic 1964 December storms. One of the two debris basins on the undisturbed watersheds nearly filled with sediment during the high water and will have to be emptied in the summer of 1965. The sediment source and amount will be determined as soon as practicable. This is the third year of calibration studies on the paired watersheds. Considerable damage occurred during the height of the storms to a fishcounting weir installed by the Department of Fish and Game downstream to measure winter runs of fish in the watersheds. Damage on the forest to roads, water tanks and bridges is still being evaluated.

During 1964 on Jackson State Forest a large demonstration of various cutting, erosion control, slash disposal and regeneration methods was initiated. Timber measurement problems were also studied. Included was a test of weighing truck loads of timber. Determining the board foot scale of timber by weighing is a technique that may be feasible for selling young growth timber on this Forest.

Tentative revisions of the management plan for Jackson Forest were prepared. Better growth and timber volume estimates are available as a result of the continuous forest inventory system established five years ago. These estimates allow recalculation of the optimum levels of cut and growing stock volume.

A preliminary study of the sprouting of redwood stumps initiated several years ago was brought up to date so that results can be published in 1965.

Recreation planning received high priority in 1964. Preliminary master recreation plans for Jackson State Forest and a proposed plan for the Mendocino Woodlands recreation area were prepared.

Two cooperative research projects with the University of California were started. One considers the physiology of root rots. Fomes annosus, a potentially devastating root rot, is of particular concern. The second study involves an out-planting of pines from Guadalupe and Cedros Islands to study the genetic variation of these unique trees and preserve seed source of the strains which are in some danger of extinction on their native islands.

Forest inventory was a major project on Latour State Forest in Shasta County. Field work instructions for the novel continuous inventory design (using the variable plot method) were published. Several permanent points for the inventory were established and inventory taken. Several road construction projects to improve forest access for management were undertaken by both timber sale contractors and Conservation Camp crews. Over one thousand Christmas trees were sold on this Forest. A larger potential sale was not possible because of early snow storms in November.

An excellent Soil and Vegetation survey of the Latour Forest was published in 1964. This survey will be used to great advantage for management and experimentation on the Forest as well as a demonstration exhibit for private owners.

Planting and reforestation experimentation continued at Latour Forest. A comparative test of season of planting indicated spring planted trees survived much better than fall planted stock. Chemical brush control was accomplished on an area to be seeded with tree seed. The management plan was revised to include recent soils and geologic information. These data improve orientation of visitors and also provide information of value in planning road work, design of experiments, and other multiple use management problems. A recreation plan was completed. Rustic campsites are the only facilities at this relatively inaccessible Forest.

By law, recreation is the primary use for Mountain Home State Forest, a multiple use forest, in Tulare County. This area, which contains some beautiful Sierra redwood and mountain scenery, is well adapted to recreation use. In order to properly plan for and serve the recreation public, an intensive survey of recreation on the State Forest was made in 1964. Mechanical traffic counters and 4,500 campers visited the forest. Major activities of the recreation seekers were camping, fishing and hunting.

One of the timber sales at Mountain Home served as an example of intensive management for timber production and esthetics. Sugar pine were reserved from cutting on this sale until the seeds had ripened. Openings and small clearings in the forest were prepared to receive this seed. Debris clean-up and cutting of defective and insect-susceptible trees was also part of the timber sale contract. The other sale was aimed at improvement of forest growth by removal of mature timber, and salvage of trees killed by bark beetles and others likely to succumb.

Ten experimental projects were conducted during 1964 on this Forest. A State Forest Note on protecting wild seedlings with wire mesh screens was published. Several photo stations were established to record long-term vegetation changes following various management practices. Chemical control of vegetation to eradicate competitive weeds and brush was another experiment. Seeding and planting trials were continued. Two areas that demonstrate Christmas tree management were treated. Further experimentation on dwarf-mistletoe parasite was carried out.

NURSERIES AND REFORESTATION

Cone crops from California forest lands supply most of the seeds for the Division's nursery and reforestation programs. The cone crop in 1963 was a near failure, and seed stores of some species were critically low. With considerable collecting effort the 1964 crop yielded a seed backlog for about two year's needs, an estimated 115 tons of cones. When processing is completed the yield of clean seed will be about 7,000 pounds.

Distribution of seedlings from four Division nurseries in the 1963-64 season was the lowest since 1956-57; from between three and four million trees to slightly more than two and one-half million. Two possible explanations are the increased activity in aerial seeding Douglas-fir in the northwest part of the State, and secondly, much less forest land burned in 1962 and 1963 to offer planting sites.

However, the distribution of State forest nursery stock is not necessarily an index of reforestation activities. More private acres were reforested than in any year since the early 1930's. Nursery stock and seed were planted on 9,295 acres, of which nearly 7,000 acres were forest industry land. Some 5,000 acres of clear-cut



LEFT - Conservation Camp workers lifting pine seedlings for shipment; Parlin Fork, Mendocino County.



RIGHT - Reforestation Advisory Committee at the Forest Service Badger Hill tree breeding orchard.

land were seeded under an approved departure from the Forest Practice Rules. California continued to rank only about the midpoint among the States in all types of reforestation on private land, yet it now ranks eighth in seeding.

Reforestation studies in cooperation with private landowners and at Division nurseries are providing valuable information. Improvement in design of a tractor drawn machine seeder constructed at Division shops accomplished successful stocking of ponderosa pine seedlings in a study in the Central Sierra Nevada.

Shading of white fir seedlings improved survival by more than one-third in test plantings. However, shading did not materially improve survival of Monterey pine seedlings; nor did top pruning to reduce the amount of transpiring surface.

Two chemicals, one applied to tops of seedlings to prevent mold in storage and the other to prevent roots from drying, did not improve survival. However, seedlings packaged in polyethylene lined kraft bags showed more planting survival than those packed in the conventional type bundle with roots wrapped in a wet wood-fibre material with tops exposed.

A number of pine hybrid seedlings developed by the Division were field planted to test their survival and growth rate in comparison with common species nursery seedlings. Over a thousand of the hybrids were planted by a Conservation Camp inmate crew. Survival on a difficult site at the end of the growing season was 73 percent.

The State Forester's 10-man Advisory Committee on Reforestation Methods and Procedures met twice during the year. One field meeting was held in the Fort Bragg area to review reforestation studies conducted by the privately endowed organization, Foundation for American Resources Management. A meeting was held in El Dorado County to observe forest genetics work of the U.S. Forest Service near Placerville, and cooperative reforestation studies on Michigan-California Lumber Company land within the 1959 Ice House burn.

PEST CONTROL

Bark beetle damage was less in 1964 than the preceding year with the exception of the southern part of the State. California flathead borers were epidemic in several areas there. White fir sawfly and Douglas-fir tussock moth defoliators were causing havoc on more than 100,000 acres in the north half of the Sierra Nevada. In Tulare and Kern counties an infestation of pandora moth is being watched. The Division took part in nine direct forest insect control projects involving 48,000 acres. One was an aerial spraying for the control of white fir sawfly.

Blister rust control, through the eradication of ribes alternate host bushes, continued on some 42,669 acres at a cost of \$78,039 State funds. Testing of antibiotics to control white pine blister rust indicates they are not practical in California at the present time.

Root diseases are being found in greater abundance in plantations, thinned stands and in seed production areas. Deer continue to cause the greatest damage on the north coast.

The California Forest Pest Control Action Council recommended more study concerning the Douglas-fir tussock moth; supported the Northwest Forest Pest Council in eradication of the European pine shoot moth; recommended a zone of infestation in the Diamond Mt. area of Lassen and Plumas counties; approved a trial for the use of a virus in the control of the tussock moth; urged prompt development of control measures to prevent a damaging buildup of root rots.

FOREST PRACTICE ACT

Disastrous 1964 flood conditions in the north coast area will affect the timber industry for a long time. Lumber and log storage and wood plant facilities were swept away by flood waters in many areas. Access roads and transportation facilities were damaged and will curtail future production and sale of forest products. As the year ended, plans were being made to recover lumber and logs swept away by flood waters. Wood processing plants and roads were being repaired to reestablish the industrial base of the community.

Under the Forest Practice Act as amended by the State Legislature in 1963, all timber operator permits issued previous to January 31, 1964, terminated by law automatically on that date. During 1964 the State Forester issued 1,435 timber operator permits and collected license fees amounting to \$21,525. Operators reported cutting 5.46 billion board feet of timber in 1963 which was one percent lower than in 1962.

The Division in 1964 made 1,936 forest practice inspections. Statewide, 90 percent of all rules inspected were found to be in compliance as compared with 86 percent in 1963. Inspectors ob-

served 1,253 infractions of the rules in 1964. Most frequent deficiency was in four rules: snag disposal, fire plans, slash disposal, and failure to post fire rules.

The Division sent timber operators 808 violation notices in 1964. Many letters and follow-up meetings were held with operators to secure compliance with the rules. Over half of the areas where repeat inspections were made came into compliance during the year. Some rule infractions were minor and did not in themselves justify revocation of a timber operator's permit. Others were more serious. Persistent infractions of rules usually constitutes grounds for litigation against an operator.

Under the amended Act, practically all of the forest practice litigation cases on hand in 1964 have since been corrected by the timber operators. The provision under the Act by which the State Forester may deny a timber operator's permit or renewal of the permit because of failure of applicant to comply with the forest practice rules was very effective in obtaining compliance in 26 aggravated cases in 1964. The permit denial procedure and the increasing practice by owners of withholding money from loggers to insure compliance with rules has improved compliance. It has also caused a shift in emphasis and has increased the workload of inspecting personnel.

Many special inspections were made last year following correction or partial correction of rules in permit denial warnings and many requests were made for final inspections so that withheld funds could be released. The denial procedure appears to be much faster and requires less effort than the litigation procedure to revoke a permit. The Division is quite optimistic about the amended Act in gaining better compliance with the forest practice rules but it is yet too early to fully evaluate its effectiveness.

Affidavits to devote 22,192 acres of timberland to purposes other than growing timber were filed in 1964 by 83 owners. This is the lowest acreage applied for timber land conversion since 1950. To improve grazing, accounted for 83 percent of the acreage, while the rest was for other agricultural use, construction, reservoirs, and urban development. Since 1946 a total of 2,537 owners have declared their intentions to devote 784,189 acres of timberland to purposes other than timber growth. A survey was made by the Division in late 1963 and early 1964 to determine the progress being made on such areas since 1946. The data has been compiled and is in the process of being analyzed.

Twelve alternate plans were approved by the Board of Forestry in 1964. These provided for better silvicultural or protectional management of timberland than the forest practice rules for which they substituted. Ten of the plans were for prompt regeneration of heavily logged areas by seeding or planting to keep the land productive.

BRUSH RANGE IMPROVEMENT

Ranchers and sportsmen used fire in the management of 78,984 acres of brush range land in California during 1964. Permits, which included recommendation regarding the use of fire, were issued to 280 individuals. These permittees conducted 226 controlled burns of which 27 were cooperative projects involving two or more ranchers. Special fire crews or regular Division fire control forces stood by in the event of the fire's escape during the burning of 41,092 acres.

Activity in this program was at about the same level as the past three years. Since 1945, over two million acres of unwanted vegetation have been treated by fire in California.

Assistance in the form of individual contacts, group demonstrations, and publications was provided by specialists among the Division's range and fire control personnel. Range specialists advised landowners of other treatment - mechanical preparation, seeding, and sprout control - used in combination with fire. During 1964, 32,019 acres were re-burned, 9,542 acres of brush were treated with mechanical equipment prior to burning, and 15,970 acres were seeded with forage plants.

Although most of the burns were conducted to improve grazing for livestock, 43 of the permit burns, almost double those of last year, were made exclusively for game habitat improvement. Additional areas were also burned for that purpose during the winter when, in some areas, permits are not required.

Range improvement study projects are conducted for demonstration and research. Generally these projects are undertaken cooperatively with agricultural specialists and owners of the land. Such projects were continued in the coastal, foothill Sierra, and Cascade areas of California.

SOIL-VEGETATION SURVEY

The Soil-Vegetation Survey of California wildlands began in 1947 and has continued steadily as a cooperative venture with the Pacific Southwest Forest and Range Experiment Station and the University of California. Currently a total of 9.7 million acres of upland soils have been mapped. Knowledge of the soil and vegetation will continue to be of great economic value as a basic land management tool.

During 1964, field mapping of 361,000 acres was completed: 132,000 acres in Del Norte County, 45,000 in Sonoma County, 52,000 in Shasta County, and 132,000 acres in Trinity County.

RESEARCH AND DEVELOPMENT

A major accomplishment in 1964 in the area of research and development was revision of the Wildland Research Plan for California, which was originally adopted in 1958. This revision was prepared by the Wildland Research Planning Committee established by the Board of Forestry and composed of representatives of all private and public sectors in the field of forestry. As the year came to the close the plan was sent to the State Printer for publication. Although considerable progress had been made since 1958, the revised plan showed that research and development in forestry had not kept pace with needs.

Two innovations in fire control techniques which have been developed essentially by the U.S. Forest Service were given some practical application in Division operations during 1964. These were the infra-red scanning and the "fire game" training devices. The former gives remarkable delineation of flames as "seen" from aircraft through smoke or fog. The fire game is a very realistic chronological presentation of problems and crises to fire managers during simulated large fire suppression procedures.

Research projects conducted or sponsored by the Division in 1964 were a continuation of existing projects and were at the same level as in the previous year. They consisted of the following:

<u>Project</u>	<u>Contractor</u>	<u>State Funds</u>
Fire Equipment Development	CDF	\$ 8,847
Economics of Fire Protection	UC	15,330
Planting Stock Physiology	UC	17,064
Forest Growth Prediction	UC	13,995
Seed Tree Effectiveness	UC	14,857
Bark Beetles	UC	8,734
California Hardwoods	UC	6,000
Dwarfmistletoe	UC	7,420
Forest Rodents	UC	8,662
"X" Disease	UC	7,950
Soil Vegetation Survey	UC/PSWFRES	116,111
Fire Climate	PSWFRES	21,000
Fire Retardants	PSWFRES	10,500
Fire Prevention	PSWFRES	15,843
Fuel Break	PSWFRES	16,800
So. California Brush Watersheds	PSWFRES	23,472

In addition to these formal projects, applied studies conducted by Division personnel in connection with other functional activities was fruitful. Examples of these study areas were hazard reduction, air attack, State Forests, nurseries and reforestation, and brush range improvement.

PUBLICATIONS OF 1964
by or in cooperation with the
Resources Agency/and being
directly related to forestry affairs

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"Senate Fact Finding Committee on Natural Resources"(a presentation at Santa Barbara, Oct.) by DeWitt Nelson. proc. 12 pp.

"Programs and Activities of the Dept. of Conservation" by DeWitt Nelson. proc. 23 pp.

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"Reforestation Studies - 1963" by Ronald S. Adams. 14 pp.

"Emergency Revegetation of Burned Watersheds - 1963", 10 pp.

"Activity in Range Improvement - 1963", 17 pp.

"Production of California Timber Operators in 1962" by Daniel Dotta. State Forest Note No. 19, 6 pp.

"Age Class and Size Grade Tests of Ponderosa Pine Planting Stock in the Central & Northern Sierra Nevada" by Ronald S. Adams. State Forest Note No. 20, 9 pp.

"California Cone Crop for 1964" by C.J. Eden. Forest Note 21, 8 pp.

"Artificial Protection of First-year Natural Seedlings in Mountain Home State Forest in 1963" by Floyd L. Otter. State Forest Note No. 22, 5 pp.

"Forest Nurseries Annual Report, 1963-64" by C.J. Eden, 7 pp.

"Latour State Forest Continuous Forest Inventory Plan" by R.W. Ritchie and R.N. Withrow, Jr., 49 pp.

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"Range Management and Timber Production" by T.F. Arvola. Am. Society of Range Mgmt., Ukiah, Nov 12, 8 pp.

"Brush Control - Ammate X Trial at Mile High" by R.H. Blanford, Fire Control Experiment No. 6, 4 pp.

"Fighting Forest Fires with Air Tankers - 1963" by C.B. Phillips, F.C. Experiment No. 7, 33 pp.

"California Conservation and Training Program", 37 pp.

"Division of Forestry in the Conservation Camp Program - 1964", proc. 29 pp.

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"Soil Fertility Studies: No. 1 - Guenoc Series" by W. Robert Powell, 4 pp. proc. CDF.

"Soil Fertility Studies: No. 2 - Guenoc Series" by W. Robert Powell, 3 pp. proc. CDF.

"Soil Fertility Studies: No. 3 - Guenoc Series" by W. Robert Powell, 2 pp. proc. CDF.

"Compound 1080 and Forest Regeneration" by Sturgis McKeever, 18 pp. proc. CDF.

"Forest Pest Conditions in California 1963", 19 pp. O.S.P.

"Wildland Soils and Associated Vegetation of Mendocino County", by Robert A. Gardner et al, 113 pp. O.S.P.

"Procedures Used for Range Land Soil Fertility Studies" by W. Robert Powell, 15 pp. proc. CDF.

"Some Range Responses to Sulfur on Sehorn Soils". 4th Annual University Soil Fertility Conference. Univ. Calif., Davis.

"Rapid Measurement of Oleoresin Exudation Pressure in Pinus Ponderosa" by R.W. Bushings and D.L. Wood. The Canadian Entomologist, July 1964.

"Identification of Insect Inclusions in X-rays on Ponderosa Pine Bark Infested by Western Pine Beetle" by A.A. Berryman. The Canadian Entomologist, June 1964.

"Description of Three New Species and New Distribution Records of California Bark Beetles" by Donald E. Bright Jr. Pan Pacific Entomologist, July 1964.

"The Biology of Pissodes Terminalis in California" by R.W. Stark and D.L. Wood. Canadian Entomologist, Nov 1964.

"A Close Look at the Soil and Vegetation Mosaic of Latour State Forest" by Edward N. Gladish and James I. Mallory. Feb., 1964 proc. CDF. 50 pp.

"Planting California Forest Lands" by Ed. E. Gilden, Ronald S. Adams, Carl L. Hawkes. UCAES Pub. AXT-127, April, 1964, 43 pp.

"Estimating Young-growth Redwood Stand Volumes with a Stand Volume Line" by J.L. Lindquist, Calif. Forestry and Forest Products No. 38, July 1964, 7 pp.

"Site Index Curves for Even-aged Young-growth Ponderosa Pine of the West-side Sierra Nevada" by L.G. Arvanitis, J. Lindquist and M. Palley. Calif. Forestry and Forest Products No. 35, February 1964, 7 pp.

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"Supplement to 'Wildland Research Plan for California' 1964" CDF, USFS, School of Forestry, et al; proc. CDF 32 pp.

"Cooperative Air Attack-Objectives and Operating Guidelines-May 1964" C.B. Phillips et al, CDF proc. 5 pp.

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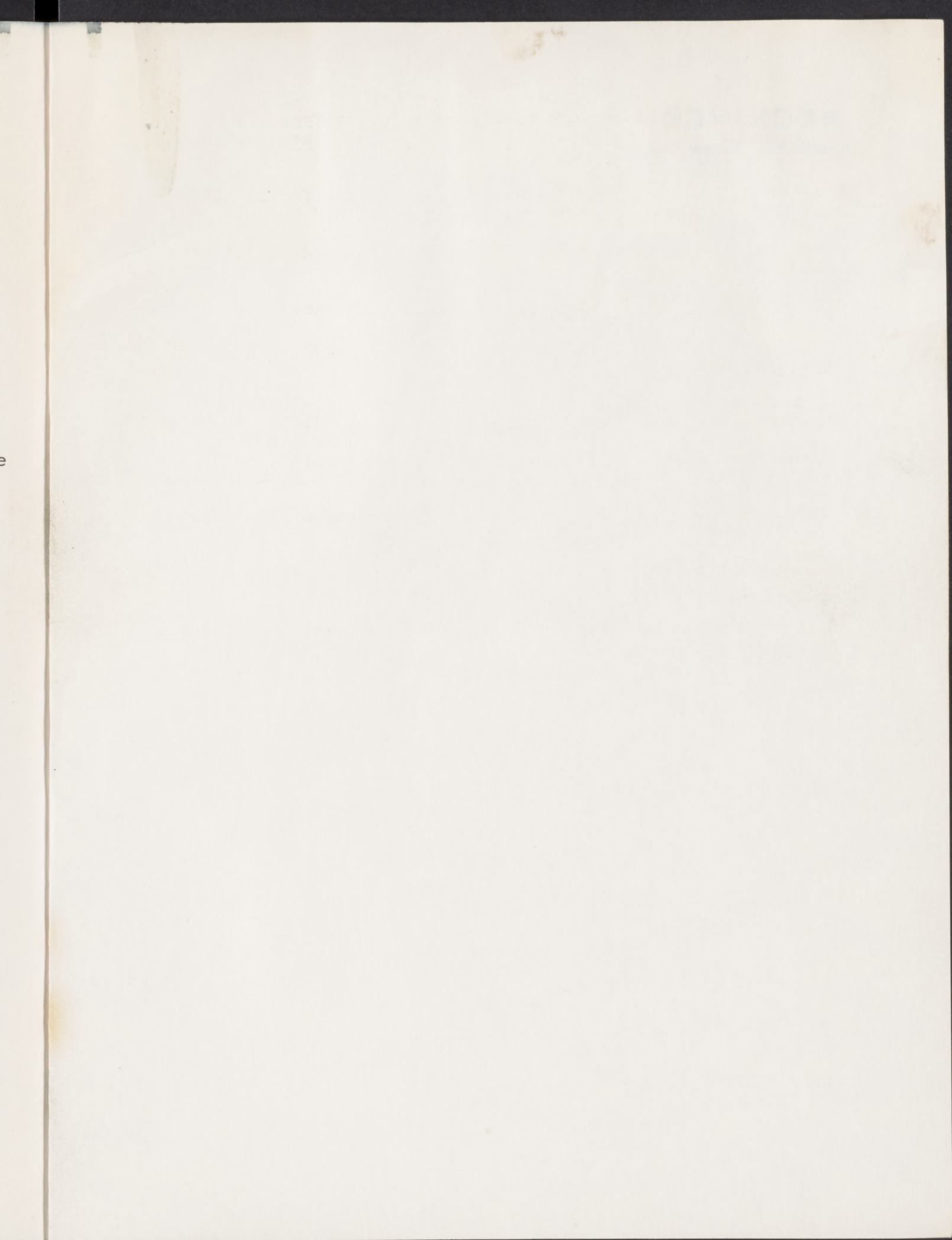
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"How Do We Improve the Economics of Regeneration", by Ronald S. Adams. The Consultant, Vol. 9, No. 4 1964.

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